

Programed Instruction in West-Germany

-- Development and Present State --

by

Ludwig J. Issing

Wurzburg Institute of Psychology
Wurzburg, Germany

Programed instruction is without doubt an "invention" of American Psychology. In the meantime, however, this new teaching and learning method has been picked up and further developed in many other countries, too. The development of programed instruction (PI) in West-Germany has to receive special attention since the center of European PI-research lies in Germany. This fact has been affirmed by Prof. G. R. Boulanger (Brussels) in the IV. Symposium on teaching machines, Dusseldorf, March, 1966.

I. Development of Programed Instruction in West-Germany

In 1960, when there already existed in the USA a considerable number of workable programs and functioning teaching machines, little was known in Germany about the principles and techniques of programed learning. In 1962/63 the first articles by German authors appeared in psychological and educational journals; these, however, were written for the main part in quite polemic fashion. Titles like "Mechanization of Instruction through Teaching Machines?", "Machine or Teacher?", "Nuremberger Trichter (royal road to learning) — made in USA", etc., were no exception. Such articles were a defense reaction of frightened teachers, who feared lest automation enter the "holy halls" of education. During that time the publications showed hardly any real understanding of the psychological principles underlying PI.

The situation changed radically with the First Nurtinger Symposium (March 1963) and the Congress on Programed Learning, which was held in Berlin, July 1963. At this congress in Berlin, for the first time, a large group of German psychologists and educators became acquainted with the scientific

fundamentals of PI, as explained by prominent American professors like E. R. HILGARD and W. SCHRAMM.

After this congress in Berlin the number of publications on PI rose drastically. The number of publications — being in 1960 one, in 1961 three, and in 1962 twelve — rose to ninety in 1963. Two journals were founded which were dedicated solely to the development and research of PI: "Deutsche Lehrprogramme fur Schule und Praxis" (1963), Manz Verlag, Munchen, and "Programmiertes Lernen und Programmierter Unterricht" (1964), Cornelsen Verlag, Berlin; additionally an information brochure: "Mitteilungen uber Programmierte Instruktion" (1963), Buro Dr. Deutsch, Darmstadt.

Imitating the development in the USA, industrial firms in Germany expected to make considerable profits through the propagation of PI. Teaching machines were produced in numerous makes, though there existed at that point no original German programs. One had to be content with translations from English. Not before 1964 were the first German programs and text books commercially available.

Publications under the topic of PI began to show the features of objective scientific reports. If PI was once rejected with spontaneous hostility, it was now accepted with almost exaggerated enthusiasm. A general open-mindedness toward experimenting with programed learning could not be overlooked. Research programs in the area of PI were started by more than 30 institutions mainly concerned with: a) basic research, and b) the development and evaluation of programs. A great number of these programs are still being continued under the aid of Deutsche Forschungsgemeinschaft and Stiftung Volkswagenwerk. The following list shows the most important institutions, working in the area of PI:

List of Institutions working in the Area of PI:
Institut fur Erziehungswissenschaft
an der Technischen Hochschule Aachen
Pädagogische Hochschule Aifeld

Institut fur Kybernetik an der
Pädagogischen Hochschule Berlin
Institut fur pädagogische
Psychologie Hochschule Berlin
Psychologisches Institut der
Universität Bochum
Technische Hochschule Darmstadt
Deutsches Institut fur Internationale
Pädagogische Forschung Frankfurt am.
Institut fur Programmirtes Lernen Giessen
Arbeitskreis Pädagogischer Hochschulen
..... Göttingen
Pädagogisches Seminar der
Universität Göttingen
Erziehungswissenschaftliches Seminar
der Universität Hamburg
Arbeitskreis zur Forderung u. Pflege
wiss. Methoden des Lehrens u.
Lernens, e. V. Heidelberg
Odenwaldschule Heppenheim/Bergstr.
Forschungsgruppe fur Programmirtes
Lernen, e. V. Köln
Pädagogische Arbeitsstätte Munchen
Pädagogische Hochschule Oldenburg
Pädagogische Hochschule Osnabrück
Pädagogisches Seminar
der Universität Tübingen
Psychologisches Institut (I)
der Universität Würzburg
Psychologisches Institut (II)
der Universität Würzburg

In January 1966, about 36 German programs were commercially available. Besides that, however, an uncontrollable number of dittoed programs existed. The following list shows how the programs commercially available are distributed over specific subjects:

subject	number of German programs
1. Mathematics	15
2. Metallurgy	4
3. Bookkeeping	3
4. Programed Instruction	3
5. Programing (techniques)	2
6. Biology	2
7. Geography	1
8. Physics	1
9. Electronics	1
10. Counseling	1
11. Professional training	1
12. Others (e.g. Chess)	2
Sum:	36

In connection with the development of PI in Germany the name of Prof. Dr. Helmar FRANK has to be mentioned. FRANK is head of the newly founded Institute for Cybernetics at the Pädagogische Hochschule Berlin. Under his direction the well known Nurtinger Symposia on teaching machines (1963, 1964, 1965, 1966) have

been held. These symposia were primarily concerned with specific programming variables as well as techniques of preparing a subject matter for computer programming. Meanwhile the symposia on teaching machines have become a permanent establishment and have acquired an almost international character. This has been shown by the great number of representatives from various countries who attended the IV. Symposium on Teaching Machines, Dusseldorf 1966. They included STOLUROW (USA), LANDA (USSR), BOULANGER (Belgium), PERRIAULT (France), BUNG (Great Britain), BIERSTEDT (Sweden), KUBALEK (CSSR) and others.

Since the last convention on PI it became clear that the German PI-research has reached the state of foreign development, but it also became clear that the problems, hypotheses, and research methods used in Germany are different from those in other countries.

II. The Characteristics of the PI — Praxis and Research in Germany

The basis for PI-research in Germany is American PI-literature, especially as far as it is available in translation (CRAM,D.,1965; FOLTZ,Ch.I., 1965; MAGER,R.F.,1965; CORRELL, W.,1965 — collection of papers by S.L. PRESSEY, B.F.SKINNER, J.C.HOLLAND et al.; SCHRAMM,W.,1966; LYSAUGHT,J.P., 1967; GLASER,R., 1967, in preparation; and others). A great number of German educators stick to the principle that American methods and results must not be taken over uncritically. They constantly direct attention to the long tradition of German pedagogy and to the obligation not to neglect culture and education beside mere instruction (e.g. NETZER,H., 1964; ZIELINSKI,J. and SCHOLER,W., 1965). In school education the programmed instruction is clearly assigned its serving function. The mediating role of the teacher is emphasized. One asks whether programmed instruction can lead the learner not only to mere reception of knowledge, but also to creative thinking (CORRELL,W., 1965; BARTMANN, TH., 1966). B. F. SKINNER on the occasion of his lecture at Giessen, February 1966, answered this question in the affirmative sense,

though he failed to show definite ways toward this goal.

At the IV. Symposium on teaching machines (1966) two camps of the convention participants could be distinguished: the practitioners and the theoreticians.

The **practitioners** — for the main part teachers in public and private schools, in adult education and in professional training, in industrial and economic training centers — have recognized the advantages of PI and demand as a consequence usable teaching programs and presenting devices. But since those are not commercially available to a satisfying extent, the practitioners take their own initiative and sometimes produce material which is not justified from the scientific point of view.

The **theoreticians**, on the other hand, criticize these products hand-made by the practitioners; for scientifically justified programming is impossible without exact basic research. This basic research has its fundamental origin in Cybernetics and information theory (CUBE,F.v.,1965; FRANK,H.,1963, 1964, 1965; ENGLERT,L.,1966). Before programming a subject matter its algorithm has to be worked out. The methods of algorithmizing a subject matter have been promoted in Germany through the works done by LANDA,L.N.(1963) and FRANK,H. (1964, 1965, 1966). Further development in this area is a necessary condition for an organized use of computers in instruction. At the present point computer-aided programs are being used for instruction and practical training only at research institutes (e.g. Institute for Cybernetics in Berlin) and in industrial firms (e.g. IBM at Sindelfingen). As in the USA, one hopes also in Germany to be able to use computer-aided programs for regular instruction for the future even in universities and schools through the installment of centralized computer systems.

At the present time programmed instruction is generally being performed at German schools in the form of programmed booklets. These are constructed, for the main part, according to the linear model (SKINNER).

Of the mechanical and electro-mechanical devices produced by German

firms, some are built in license received by American firms; some, however, have been developed in Germany. The most famous teaching machine of the latter kind is the PROBITON — apparatus by Prof. J. ZIELINSKI and W. SCHOLER (Aachen). This device permits the presentation of a program — consisting of a program text, picture illustrations, and sound recordings. Another device, the ROBIMAT developed by Prof. H. FRANK and R. KISTNER (Berlin, 1965) gives each student the possibility to answer questions of the teacher with "Yes" or "No" by pressing one of two keys, whereafter a light signal informs him immediately about the correctness of his answer. A similar device has been constructed by DOBRINSKI (1965); his apparatus, however, has an advantage compared to the ROBIMAT because the teacher is able to check the percentage of "Yes" — and "No" — answers of his class to a given question on a special recording instrument. BOLKOW, a West-German firm is working on a mechanical device, called DIATON, which is said to allow the presentation of fully-branched audio-visual programs.

The most technical perfection has been achieved till now, undoubtedly, in the area of audio-visual laboratories. The establishment of A-V-labs is being promoted especially at high schools, since instruction in at least two foreign languages is a major teaching goal in German high school education. The courses are being performed according to the principles of programmed learning. Sound, text, and illustrations are used to help the student. Teaching programs for foreign language instructions are constantly revised and improved.

It can be seen that the once exaggerated enthusiasm for PI is now giving way to a critical, objective discussion. At colleges, students get acquainted with this new method of instruction; experiments and studies in the use of PI in schools are supported. For a large scale use of PI in education, however, the small number of tested programs is problematic. Looking at the present situation, it can be concluded that it will take at least ten years until the German schools will take profit of the advantages of PI to a large extent.

Important PI-Addresses in Germany

Gesellschaft für Programmierte
Instruktion
(Society for Programed Instruction)
c/o Institut für Kybernetik
Pädagogische Hochschule Berlin
Malteserstrasse 74-100
1 Berlin 46
Institut für Programmiertes Lernen
Prof. Dr. Werner Correll
Justus-Liebig-Universität
63 Giessen
Pädagogisches Zentrum
Dokumentationsabteilung
Berlinerstrasse 40/41
1 Berlin 31
Psychologisches Institut (II)
der Universität Würzburg
February 1967

German Literature in the Area of Programed Instruction (Selection)

- Bartmann, Th.: Denkerziehung im programmierten Unterricht, Manz, München, 1966
- Correll, W.: Programmiertes Lernen und Lehrmaschinen. Eine Quellensammlung zur Theorie und Praxis des programmierten Lernens, Westermann, Braunschweig, 1965
- Correll, W.: Programmiertes Lernen und schöpferisches Denken. In: Studienhefte der pädagogischen Hochschule (Ed.: Luckert, H.R.), Psychologie, München, 1965
- Cram, D.: Lehrmaschinen, Lehrprogramme, Beltz, Weinheim, 1965
- Cube, F.v.: Kybernetische Grundlagen des Lernens und Lehrens, Stuttgart, 1965
- Czempfer, K. A. & Broschau, H.: Unterricht und Computer, Oldenbourg, München, 1965
- Deutsche Lehrprogramme für Schule und Praxis, 1, 1964, (journal), Manz, München
- Deutsch, J. H. R.: Mitteilungen über programmierte Instruktion No. 1, August 1963, No. 2, November 1963, No. 3, März 1964 (journal)
- Dobrinski, P.: Über eine Testeinrichtung zur quantitativen Erfassung des Lehrer-Erfolgs beim konventionellen Unterricht. In: Praxis und Perspektiven des Programmierten Unterrichts, 1965, S.129-138
- Englert, L. et al. (Eds.): Lexikon der kybernetischen Pädagogik und der Programmierten Instruktion, Schnell, Quickborn, 1966
- Foltz, Ch. I.: Lehrmaschinen, Beltz, Weinheim, 1965
- Frank, H.: Kybernetische Grundlagen der Pädagogik, Baden-Baden, 1962
- Frank, H. (Ed.): Lehrmaschinen in kybernetischer und pädagogischer Sicht, 1/1963, II/1964, III/1965
- Frank, H.: Kybernetische Betrachtungen über Lehr- und Lernprozesse. In: Programmiertes Lernen und Programmierter Unterricht, 1964, No. 1, pp. 22-31
- Frank, H. (Ed.): Kybernetik — Brücke zwischen den Wissenschaften, Umschau, Frankfurt, 3. ed., 1964
- Frank, H.: Lehrautomaten für Einzel- und Gruppenschulung. In: H. Frank (Ed.): Lehrmaschinen in kybernetischer und pädagogischer Sicht, III, Klett/Stuttgart, Oldenbourg/München, 1965
- Frank, H.: Lehralgorithmen und Lehrautomaten. In: W. Kroebel (Ed.): Vorträge des Kieler Kybernetik Kongresses. Oldenbourg, München, 1966
- Glaser, R. (Ed.): Lehrmaschinen und Programmierter Unterricht, II Cornelsen, Berlin (in preparation)
- Gunzenhauser, R.: Informationstheoretische Grundlagen künftiger Lehrmaschinen. In: Lehrmaschinen in kybernetischer und pädagogischer Sicht, Klett-Oldenbourg, 1963, pp. 36-44
- Hilgard, E.: Kernprobleme der Lernpsychologie und des Programmierten Lernens. In: Die Deutsche Schule 55, 1963, Vol. 10, pp. 497-508
- Hilgard, E. R.: Lerntheorien und ihre Anwendung. In: Programmiertes Lernen und Programmierter Unterricht 1, 1964, Vol. 1, pp. 16-22
- Hitz, M. (Ed.): Praxis und Perspektiven des Programmierten Unterrichts, Schnelle, Quickborn, 1965
- Issing, L. J.: Die Denver-Versuche (I) 1. part: Versuche mit muttersprachlichen und Fremdsprachen-Lehrprogrammen in High Schools and Grundschulen. In: Deutsche Lehrprogramme, I, 1966, pp. 25-28
- Issing, L. J.: Die Denver-Versuche (II) 2. part: Einordnung des Schulfernsehens in den Lernprozeß — Die Mittelstellung des Lehrers im Programmierten Unterricht und Schulfernsehen. In: Deutsche Lehrprogramme, II, 1966, pp. 19-22
- Issing, L. J.: Der Programmierter Unterricht in den USA heute, Beltz, Weinheim, 1967
- Klauwer, K. J.: Programmierter Unterricht in Sonderschulen, Marhold Berlin-Charlottenburg, 1964
- Komoski, P. K.: Der Programmierter Unterricht und seine Stellung im Bildungswesen. In: Programmierter Lernen und Programmierter Unterricht 1, 1964, Vol. 1, pp. 3-11
- Landa, L. N.: Kybernetik und Unterrichtstheorie. In: Deutsche Lehrerzeitung No. 9,10,11,12; 1963
- Ludwig, E. H.: Die Technik zur Herstellung von Lehrprogrammen für die programmierte Unterweisung, Henn, Ratingen, 1965
- Lysaught, J. P. & Williams, C.: Einführung in die Unterrichtsprogrammierung, Oldenbourg, München, 1967
- Mager, R. F.: Lernziele und Programmierter Unterricht, Beltz, Weinheim, 1965
- Netzer, H.: Lernprogramme und Lehrmaschinen, Klinkhardt, Heilbrunn/Obb., 1964
- Praxis und Perspektiven des programmierten Unterrichts. Referate des 3. Nürtinger Symposions über Lehrmaschinen, 1965.
- Programmiertes Lernen und Programmierter Unterricht, 1, 1964, (journal), F. Cornelsen, Berlin
- Programmierter Unterricht und Lehrmaschinen. Bericht Internationale Konferenz Berlin 1963, Ed.: Pädagogische Arbeitsstelle Berlin, 1964
- Roth, H. & Blumenthal, A. (Eds.): Der programmierte Unterricht. Grundlegende Aufsätze aus der Zeitschrift "Die Deutsche Schule", Hanover, 1963
- Schiefele, H.: Programmierter Unterweisung, München, 1964
- Schiefele, H.: Lehrprogramme in der Schule. Grundlagen-Versuche-Erfahrungen. Schriften der Pädagogischen Hochschule Bayerns, München, 1966
- Schramm, W.: Programmierter Unterricht heute und morgen, Cornelsen, Berlin, Bielefeld, 1963
- Schramm, W.: Die Forschung auf dem Gebiet des programmierten Lernens. In: Die Deutsche Schule 55, 1963, Vol. 9, pp. 443-456
- Schramm, W.: Vier Fallstudien über Programmierten Unterricht, Cornelsen, Berlin, 1966
4. Symposium über Lehrmaschinen in Düsseldorf vom 9 — 13. März 1966 Arbeitsgemeinschaft programmierter Instruktion

Vogt, H.: Programmierter Unterricht und Lehrmaschinen im sowjetischen Bildungswesen. In: Deutsche Universitätszeitung, No. 7, 1963

Vogt, H.: Kybernetik und Sowjetpädagogik. Lehrmaschinen, 1963, pp. 73-91

Vogt, H.: Algorithmisierung und Programmierung. In: Deutsche Lehrprogramme, 3, 1965, Manz, München

Vogt, H.: Der Nurnberger Trichter. Lernmaschinen für Ihr Kind? Kosmos-Franck'sche Verlagshandlung, Stuttgart, 1966

Vogt, H.: Programmierter Unterricht

und Lehrmaschinen an Hoch- und Fachschulen der Sowjetunion, Manz, München, 1966

Weltner, K.: Zur empirischen Bestimmung subjektiver Informationswerte von Lehrbuchtexten mit dem Ratest nach Shannon. Grundlagenstudien aus Kybernetik und Geisteswissenschaft, 5, Vol. 1, 1964

Wörterbuch: Programmierter Unterricht — Kleine Terminologie der kybernetischen Pädagogik, Manz, München, 1964

Zeitschrift für erziehungswissenschaftliche Forschung, Manz, München (First Vol. March/April 1967)

Zielinski, J. & Scholer, W.: Theoretische Grundlegung und ausführliche Beschreibung des Aachener PROBITON, einer apparativen Lernhilfe für den Gebrauch im Unterricht. Aachen, 1964

Zielinski, J. & Scholer, W.: Pädagogische Grundlagen der programmierten Unterweisung unter empirischem Aspekt, Henn, Ratingen, 1964

Zielinski, J. & Scholer, W.: Methodik des Programmierten Unterrichts, Henn, Ratingen, 1965

Zypkin, J. S.v.: Adaptation und Lernen in automatischen Systemen, Oldenbourg, München, 1966.

A one week Instructional Technology Workshop will be offered during the week of July 24, by General Programmed Teaching of Palo Alto, California. The workshop will be held at the Lincolnwood Hyatt House in Chicago.

The course instructor will be Dr. W. A. Deterline. The workshop itself is programmed, including programmed lectures and demonstrations, programmed audiovisual units, and programmed text exercises.

The registration fee is \$275. Information regarding course objectives, registration, etc., can be obtained by writing Dr. Deterline at General Programmed Teaching, 424 University Avenue, Palo Alto, California, 94301.

A new educational system is being developed which uses the computer as an aid to the teacher in providing each student with an individual program of study, tailored to his needs, abilities and objectives.

The system, called Project PLAN (Program for Learning in Accordance with Needs), will be introduced this fall in twelve school districts in New York, California, Massachusetts, Pennsylvania and West Virginia.

Announcement of Project PLAN was made today by Donald H. McGannon, Chairman of the Westinghouse Learning Corporation and

News Releases

John C. Flanagan, Chairman of the American Institutes for Research in the Behavioral Sciences (A.I.R.), who said support and financing for the project is being provided by Westinghouse Learning, A.I.R., and the participating school districts.

To achieve the aims of the system, student and teacher work together to arrive at detailed objectives appropriate to the student's plans, learning ability and potential. Their next step is to select instructional methods and materials geared to these objectives from a complete file of study units specially assembled for Project PLAN. At the completion of each unit, the student's performance and progress are evaluated, and the next set of units assigned.

The student thereby proceeds at his own pace on a course of study created to fill his particular needs.

This individualization of education is made possible by the use of the computer as an information processing, storage and retrieval tool. Stored in the computer is detailed information on each student participating in Project PLAN —

what he knows, how he learns, his interests, potentials and plans. Available from the computer on a daily basis is the comprehensive "teaching-learning units" file from which his individual study plan is built, as well as programs for scoring, analyzing and reporting his progress.

The system is completely flexible, designed to be installed in today's schools, and to be implemented in current classroom facilities. The major piece of equipment involved, the computer, is located at the A.I.R. headquarters in Palo Alto, California, and connected directly to the schools via individualized terminals.

The Center for Programmed Learning for Business of the University of Michigan Graduate School of Business Administration has scheduled the second of its summer **Instructional Design Workshops** for August 13-18, 1967.

This workshop will be of special benefit to instructors, training coordinators, on-the-job trainers, training consultants and others charged with the responsibility of designing courses.

For detailed information about registration and room reservations write the Registrar, Center for Programmed Learning for Business, 340 South State Street, Ann Arbor, Michigan 48104.